*Installation Instructions*

# MicroLogix 1400 Programmable Controllers

Catalog Number(s) 1766-L32AWA, 1766-L32AWAA, 1766-L32BWA, 1766-L32BWAA, 1766-L32BXB, 1766-L32BXBA

http://literature.rockwellautomation.com/idc/groups/literature/documents/in/1766-in001_-mu-p.pdf

| | |
|---|---|
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# Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://literature.rockwellautomation.com) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

| | |
|---|---|
| **WARNING** | Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss. |
| **IMPORTANT** | Identifies information that is critical for successful application and understanding of the product. |
| **ATTENTION** | Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard and recognize the consequences. |
| **SHOCK HAZARD** | Labels may be on or inside the equipment (for example, drive or motor) to alert people that dangerous voltage may be present. |
| **BURN HAZARD** | Labels may be on or inside the equipment (for example, drive or motor) to alert people that surfaces may reach dangerous temperatures. |

## Environment and Enclosure

**ATTENTION**

This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 meters (6562 ft) without derating.

This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance.

This equipment is supplied as open-type equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The enclosure must have suitable flame-retardant properties to prevent or minimize the spread of flame, complying with a flame spread rating of 5VA, V2, V1, V0 (or equivalent) if non-metallic. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

## Preventing Electrostatic Discharge

**ATTENTION**

This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wriststrap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- Use a static-safe workstation, if available.
- Store the equipment in appropriate static-safe packaging when not in use.

# North American Hazardous Location Approval

The following modules are North American Hazardous Location approved: 1766-L32AWA, 1766-L32AWAA, 1766-L32BWA, 1766-L32BWAA, 1766-L32BXB, 1766-L32BXBA

| **The following information applies when operating this equipment in hazardous locations:** | **Informations sur l'utilisation de cet équipement en environnements dangereux:** |
|---|---|
| Products marked "CL I, DIV 2, GP A, B, C, D" are suitable for use in Class I Division 2 Groups A, B, C, D, Hazardous Locations and nonhazardous locations only. Each product is supplied with markings on the rating nameplate indicating the hazardous location temperature code. When combining products within a system, the most adverse temperature code (lowest "T" number) may be used to help determine the overall temperature code of the system. Combinations of equipment in your system are subject to investigation by the local Authority Having Jurisdiction at the time of installation. | Les produits marqués "CL I, DIV 2, GP A, B, C, D" ne conviennent qu'à une utilisation en environnements de Classe I Division 2 Groupes A, B, C, D dangereux et non dangereux. Chaque produit est livré avec des marquages sur sa plaque d'identification qui indiquent le code de température pour les environnements dangereux. Lorsque plusieurs produits sont combinés dans un système, le code de température le plus défavorable (code de température le plus faible) peut être utilisé pour déterminer le code de température global du système. Les combinaisons d'équipements dans le système sont sujettes à inspection par les autorités locales qualifiées au moment de l'installation. |

**WARNING**

**EXPLOSION HAZARD**

- Do not disconnect while the circuit is live or unless the area is known to be free of ignitible concentrations.
- Do not disconnect connections to this equipment unless power has been removed or the area is known to be nonhazardous. Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product.
- Substitution of components may impair suitability for Class I, Division 2.
- Do not remove or replace lamps, fuses or plug-in modules (as applicable) unless power has been disconnected or the area is known to be free of ignitible concentrations of flammable gases or vapors.

**AVERTISSEMENT**

**RISQUE D'EXPLOSION**

- Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement.
- Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher les connecteurs. Fixer tous les connecteurs externes reliés à cet équipement à l'aide de vis, loquets coulissants, connecteurs filetés ou autres moyens fournis avec ce produit.
- La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnement de Classe I, Division 2.
- S'assurer que l'environnement est classé non dangereux avant de changer les piles.

## Additional Resources

| Resource | Description |
|---|---|
| MicroLogix 1400 Programmable Controllers User Manual 1766-UM001 | A more detailed description of how to install and use your MicroLogix 1400 programmable controller and expansion I/O system. |
| MicroLogix 1400 Instruction Set Reference Manual 1766-RM001 | A reference manual that contains data and function files, instruction set, and troubleshooting information for MicroLogix 1400. |
| Installation Instructions 1762-INxxx | Information on installing and using 1762 expansion I/O modules. |
| Industrial Automation Wiring and Grounding Guidelines 1770-4.1 | More information on proper wiring and grounding techniques. |

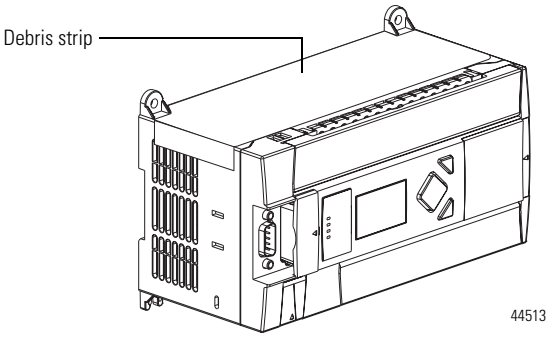
If you would like a manual, you can:

- download a free electronic version from the internet: http://literature.rockwellautomation.com
- purchase a printed manual by contacting your local Allen-Bradley distributor or Rockwell Automation representative

# Overview

MicroLogix 1400 controllers are suitable for use in an industrial environment when installed in accordance with these instructions. Specifically, this equipment is intended for use in clean, dry environments (Pollution degree 2[1]) and with circuits not exceeding Over Voltage Category II[2] (IEC 60664-1)[3]. AC powered products must be connected to the secondary of an isolating transformer.

Install your controller using these installation instructions.




**ATTENTION**

Do not remove the protective debris strip until after the controller and all other equipment in the panel near the controller are mounted and wiring is complete. Once wiring is complete, remove protective debris strip. Failure to remove strip before operating can cause overheating.

**ATTENTION**

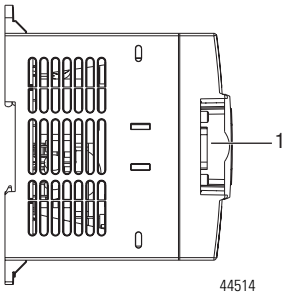
Electrostatic discharge can damage semiconductor devices inside the controller. Do not touch the connector pins or other sensitive areas.

(1) Pollution Degree 2 is an environment where, normally, only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation shall be expected.

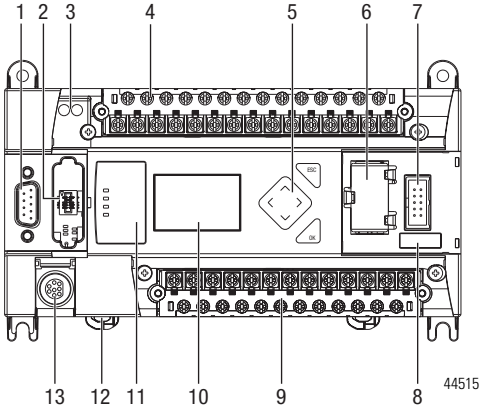
(2) Over Voltage Category II is the load level section of the electrical distribution system. At this level transient voltages are controlled and do not exceed the impulse voltage capability of the product's insulation.

(3) Pollution Degree 2 and Over Voltage Category II are International Electrotechnical commissions (IEC) designations.

## Controller Description




Left side view




Top view

| | Description |
|---|---|
| 1 | Comm port 2 - 9-pin D-Shell RS-232C connector |
| 2 | Memory module (refer to MicroLogix 1400 Memory Module Installation Instructions, publication 1766-IN010 for instructions on installing the memory module). |
| 3 | User 24V (for 1766-L32BWA and 1766-L32BWAA only) |
| 4 | Input terminal block |
| 5 | LCD Display Keypad (ESC, OK, Up, Down, Left, Right) |
| 6 | Battery compartment |
| 7 | 1762 expansion bus connector |
| 8 | Battery connector |
| 9 | Output terminal block |
| 10 | LCD Display |
| 11 | Indicator LED panel |
| 12 | Comm port 1 - RJ45 connector |
| 13 | Comm port 0 - 8-pin mini DIN RS-232C/RS-485 connector |

## Controller Input and Output Description

| Catalog Number | Description | | | | |
|---|---|---|---|---|---|
| | Input Power | User Power | Embedded Discrete I/O | Embedded Analog I/O | Comm. Ports |
| 1766-L32BWA | 100/240V AC | 24V DC | 12 Fast 24V DC Inputs<br>8 Normal 24V DC Inputs<br>12 Relay Outputs | None | 1 RS232/RS485[1]<br>1 Ethernet/IP<br>1 RS232[2] |
| 1766-L32AWA | | None | 20 120V AC Inputs<br>12 Relay Outputs | | |
| 1766-L32BXB | 24 V DC | | 12 Fast 24V DC Inputs<br>8 Normal 24V DC Inputs<br>6 Relay Outputs<br>3 Fast DC Outputs<br>3 Normal DC Outputs | | |
| 1766-L32BWAA | 100/240V AC | 24V DC | 12 Fast 24V DC Inputs<br>8 Normal 24V DC Inputs<br>12 Relay Outputs | 4 Voltage Inputs<br>2 Voltage Outputs | |
| 1766-L32AWAA | | None | 20 120V AC Inputs<br>12 Relay Outputs | | |
| 1766-L32BXBA | 24V DC | | 12 Fast 24V DC Inputs<br>8 Normal 24V DC Inputs<br>6 Relay Outputs<br>3 Fast DC Outputs<br>3 Normal DC Outputs | | |

(1) Isolated RS-232/RS-485 combo port. Same as ML1100 Comm 0

(2) Non-isolated RS-232. Standard D-sub connector

## Hazardous Location Considerations

This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only. The following WARNING statement applies to use in hazardous locations.

**WARNING**

**EXPLOSION HAZARD**

- Substitution of components may impair suitability for Class I, Division 2.
- Do not replace components or disconnect equipment unless power has been switched off.
- Do not connect or disconnect components unless power has been switched off.
- This product must be installed in an enclosure. All cables connected to the product must remain in the enclosure or be protected by conduit or other means.
- All wiring must comply with N.E.C. article 501-10(b) and/or in accordance with Section 18-1J2 of the Canadian Electrical Code, and in accordance with the authority having jurisdiction.

Use only the following communication cables in Class I, Division 2 hazardous locations.

| Environment Classification | Communication Cables |
|---|---|
| Class I, Division 2 Hazardous Environment | 1761-CBL-AC00 Series C or later |
| | 1761-CBL-AM00 Series C or later |
| | 1761-CBL-AP00 Series C or later |
| | 1761-CBL-PM02 Series C or later |
| | 1761-CBL-HM02 Series C or later |
| | 2707-NC9 Series C or later |
| | 1763-NC01 Series A or later |
| | 1747-CP3 Series |

## Environnements dangereux

Cet équipement est conçu pour une utilisation en environnements dangereux de Classe I, Division 2, Groupes A, B, C, D ou non dangereux. La mise en garde suivante s'applique à utilisation en environnements dangereux.

**WARNING**

### DANGER D'EXPLOSION

- La substitution de composants peut rendre cet équipement impropre à une utilisation en environnement de Classe I, Division 2.
- Ne pas remplacer de composants ou déconnecter l'équipement sans s'être assuré que l'alimentation est coupée.
- Ne pas connecter ou déconnecter des composants sans s'être assuré que l'alimentation est coupée.
- Ce produit doit être installé dans une armoire. Tous les câbles connectés à l'appareil doivent rester dans l'armoire ou être protégés par une goulotte ou tout autre moyen.
- L'ensemble du câblage doit être conforme à la réglementation en vigueur dans les pays où l'appareil est installé.

Utilisez uniquement les câbles de communication suivants dans les environnements dangereux de Classe I, Division 2.

| Classification des environnements | Câbles de communication |
|---|---|
| Environnement dangereux de Classe I, Division 2 | 1761-CBL-AC00 série C ou ultérieure |
| | 1761-CBL-AM00 série C ou ultérieure |
| | 1761-CBL-AP00 série C ou ultérieure |
| | 1761-CBL-PM02 série C ou ultérieure |
| | 1761-CBL-HM02 série C ou ultérieure |
| | 2707-NC9 série C ou ultérieure |
| | 1763-NC01 série A ou ultérieure |
| | série 1747-CP3 |

**ATTENTION**

### UNSUPPORTED CONNECTION

Do not connect the Comm0 port on the MicroLogix 1400 controller to another MicroLogix family controller such as MicroLogix 1000, MicroLogix 1200, or MicroLogix 1500 using a 1761-CBL-AM00 (8-pin mini-DIN to 8-pin mini-DIN) cable or equivalent.
This type of connection will cause damage to the RS-232/485 communication port (Channel 0) of the MicroLogix 1400 and/or the controller itself. Communication pins used for RS-485 communications are alternately used for 24V power on the other MicroLogix controllers.

# Mount the Controller

## General Considerations

Most applications require installation in an industrial enclosure to reduce the effects of electrical interference and environmental exposure. Locate your controller as far as possible from power lines, load lines, and other sources of electrical noise such as hard-contact switches, relays, and ac motor drives. For more information on proper grounding guidelines, see the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

**ATTENTION**

Mount the controller horizontally only. Vertical mounting is not supported due to thermal considerations.

**ATTENTION**

Be careful of metal chips when drilling mounting holes for your controller or other equipment within the enclosure or panel. Drilled fragments that fall into the controller could cause damage. Do not drill holes above a mounted controller if the protective debris strips have been removed.

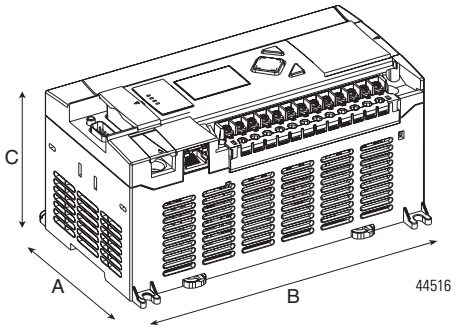
**WARNING**

Do not place the MicroLogix 1400 Programmable Controller in direct sunlight. Prolonged exposure to direct sunlight could degrade the LCD display.

**WARNING**

The local programming terminal port is intended for temporary use only and must not be connected or disconnected unless the area is assured to be nonhazardous.

## Mounting Dimensions

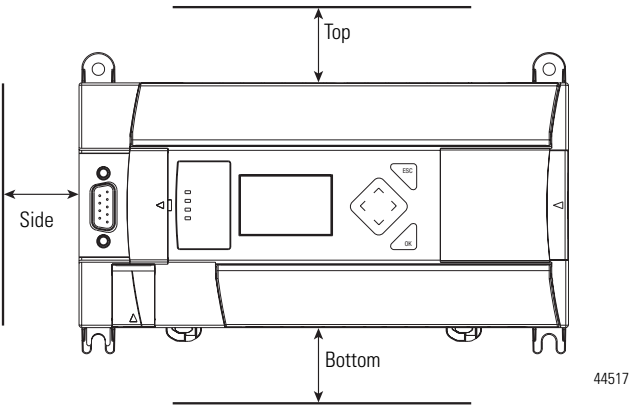



1766-L32BWA, 1766-L32AWA, 1766-L32BXB,
1766-L32BWAA, 1766-L32AWAA, 1766-L32BXBA

| Dimension | Height |
|---|---|
| A | 90 mm (3.5 in.) |
| B | 180 mm (7.087 in.) |
| C | 87 mm (3.43 in.) |

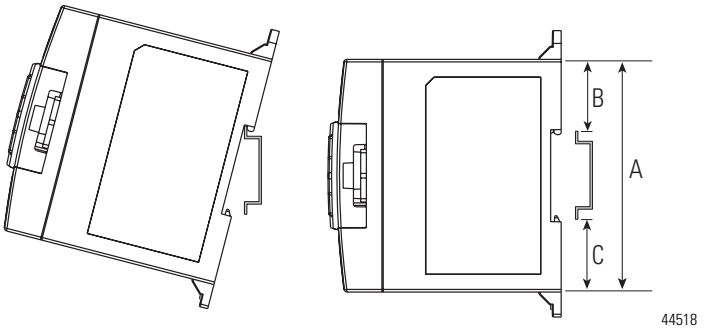
## Controller Spacing

The controller mounts horizontally, with the expansion I/O extending to the right of the controller. Allow 50 mm (2 in.) of space on all but the right side for adequate ventilation, as shown below.



## DIN Rail Mounting

The maximum extension of the latch is 14 mm (0.55 in.) in the open position. A flat-blade screwdriver is required for removal of the controller. The controller can be mounted to EN50022-35x7.5 or EN50022-35x15 DIN rails. DIN rail mounting dimensions are shown below.




| Dimension | Height |
|---|---|
| A | 90 mm (3.5 in.) |
| B | 27.5 mm (1.08 in.) |
| C | 27.5 mm (1.08 in.) |

Follow these steps to install your controller on the DIN rail.

1. Mount your DIN rail. Make sure that the placement of the controller on the DIN rail meets the recommended spacing requirements (see Controller Spacing on page 14 for more information). Refer to the mounting template inside the back cover of this document.
2. If it is open, close the DIN latch.
3. Hook the top slot over the DIN rail.
4. While pressing the controller down against the top of the rail, snap the bottom of the controller into position.
5. Leave the protective debris strip attached until you are finished wiring the controller and any other devices.

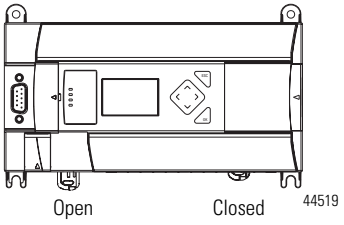
Follow these steps to remove your controller from the DIN rail.

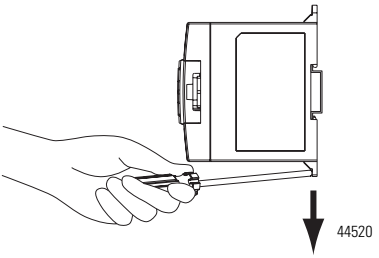
1. Place a flat-blade screwdriver in the DIN rail latch at the bottom of the controller.

2. Holding the controller, pry downward on the latch until the latch locks in the open position.

3. Repeat steps 1 and 2 for the second DIN rail latch.

4. Unhook the top of the DIN rail slot from the rail.




## Panel Mounting

Mount to panel using #8 or M4 screws. Follow these steps to install your controller using mounting screws.

1. Remove the mounting template from inside the back cover of this document.

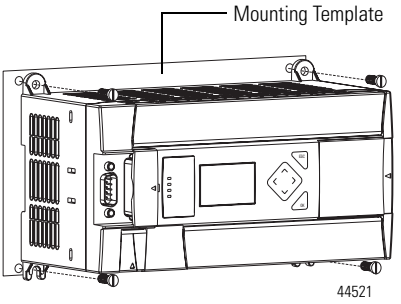
2. Secure the template to the mounting surface. Make sure your controller is spaced properly (see Controller Spacing on page 14 for more information).

3. Drill holes through the template.

4. Remove the mounting template.

5. Mount the controller.

6. Leave the protective debris strip in place until you are finished wiring the controller and any other devices



## Using the Battery

The MicroLogix 1400 controller is equipped with a replaceable battery (catalog number 1747-BA). The Battery Low indicator on the LCD display of the controller shows the status of the replaceable battery. When the battery is low, the indicator is set (displayed as a solid rectangle). This means that either the battery wire connector is disconnected, or the battery may fail within 2 days if it is connected.

**IMPORTANT**

The MicroLogix 1400 controller ships with the battery wire connector connected. Ensure that the battery wire connector is inserted into the connector port if your application needs battery power. For example, when using a real-time clock (RTC).

Replacing the battery when the controller is powered down will lose all user application memory. Replace the battery when the controller is powered on. Refer to the SLC 500 Lithium Battery Installation Instructions, publication 1747-IN515, for more information on installation, handling, usage, storage, and disposal of the battery.

**WARNING**

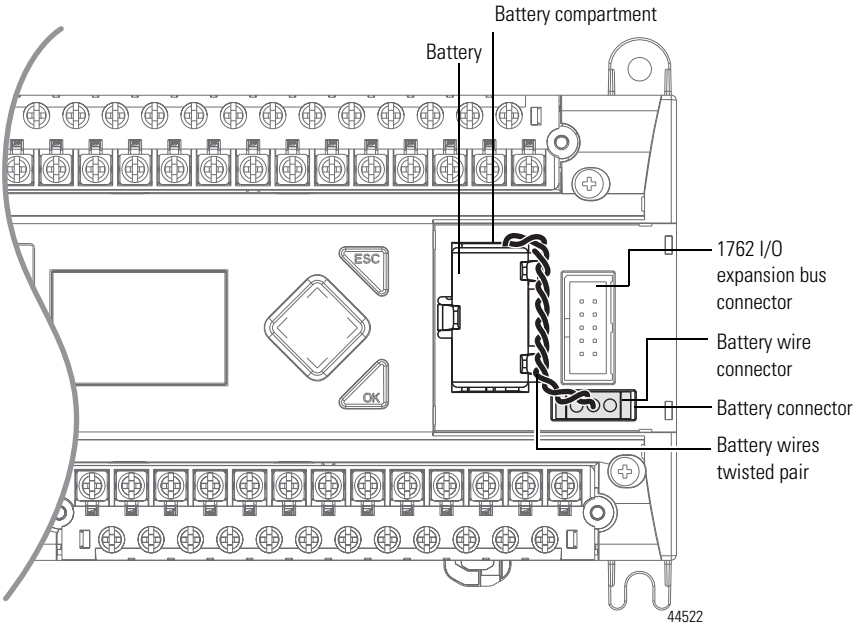
When you connect or disconnect the battery an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that the area is nonhazardous before proceeding.

For Safety information on the handling of lithium batteries, including handling and disposal of leaking batteries, see Guidelines for Handling Lithium Batteries, publication AG 5-4.

Follow these steps to connect the replaceable battery.

1. Insert the replaceable battery wire connector into the controller's battery connector.

2. Secure the battery connector wires so that it does not block the 1762 expansion bus connector as shown below.




## Connect 1762 I/O Expansion Modules

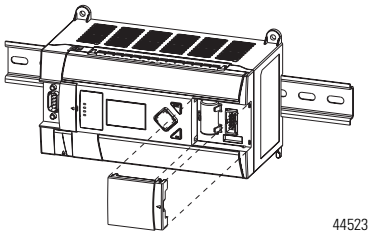
**ATTENTION**

Remove power from the system before installing or removing expansion I/O or damage to the controller may result.

Connect 1762 I/O after mounting the controller.

1. Remove the expansion port cover to install expansion I/O modules.
2. Plug the ribbon cable connector into the bus connector.

3. Replace the cover as shown below.




The MicroLogix 1400 controller is designed to support up to any seven 1762 expansion I/O modules.

For detailed information on using expansion I/O, refer to the installation instructions for your expansion module.

## Wire the Controller

The shading in the following terminal block illustrations indicates which terminal groups are tied to which commons.

## Terminal Block Layouts

**WARNING**

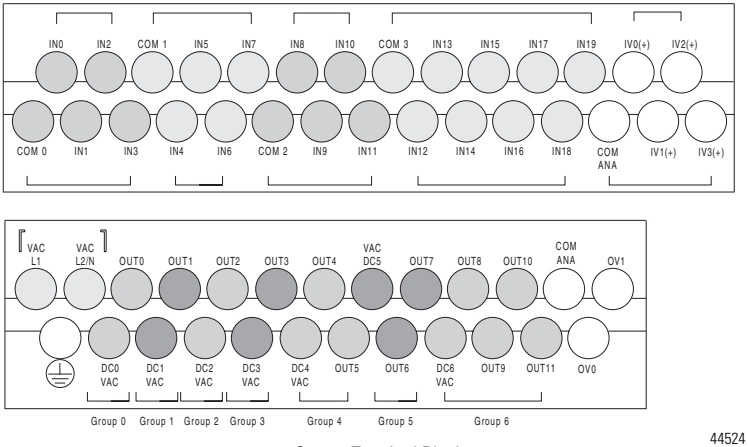
When you connect or disconnect the Removable Terminal Block (RTB) with field side power applied, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

**WARNING**

When used in a Class I, Division 2, hazardous location, this equipment must be mounted in a suitable enclosure. All wiring must be in accordance with Class I, Division 2 wiring methods of Article 501 of the National Electrical Code and/or in accordance with Section 18-1J2 of the Canadian Electrical Code, and in accordance with the authority having jurisdiction.

## 1766-L32BWA/L32BWAA

Input Terminal Block

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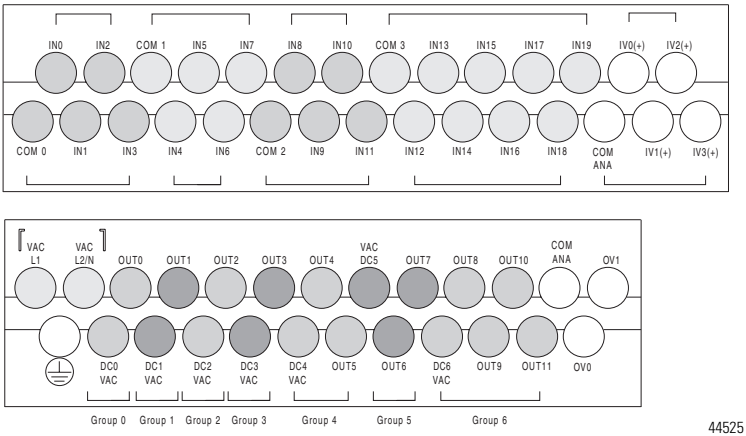
Output Terminal Block

## 1766-L32AWA/L32AWAA

Input Terminal Block

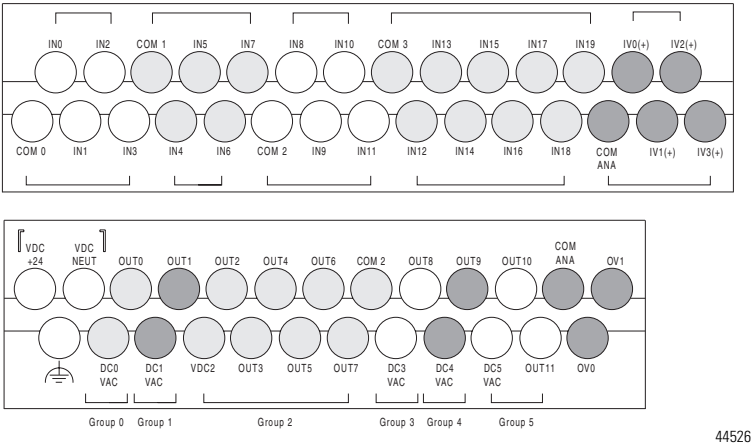



44525

Output Terminal Block

## 1766-L32BXB/L32BXBA

Input Terminal Block




44526

| Wire Type | | Wire Size |
|---|---|---|
| Solid wire | Cu-90°C (194°F) | 14…22 AWG |
| Stranded wire | Cu-90°C (194°F) | 16…22 AWG |

Wiring torque = 0.791Nm (7 in-lb) rated.

## Output Terminal Grouping

| Controller | Output Group | Description | Outputs Voltage Terminal | Output Terminal |
|---|---|---|---|---|
| 1766-L32BWA<br>1766-L32BWAA | Group 0 | Isolated relay output | VAC/DC0 | OUT 0 |
| | Group 1 | Isolated relay output | VAC/DC1 | OUT 1 |
| | Group 2 | Isolated relay output | VAC/DC2 | OUT 2 |
| | Group 3 | Isolated relay output | VAC/DC3 | OUT 3 |
| | Group 4 | Isolated relay output | VAC/DC4 | OUT 4, OUT 5 |
| | Group 5 | Isolated relay output | VAC/DC5 | OUT 6, OUT 7 |
| | Group 6 | Isolated relay output | VAC/DC6 | OUT 8…11 |

## Output Terminal Grouping

| Controller | Output Group | Description | Outputs Voltage Terminal | Output Terminal |
|---|---|---|---|---|
| 1766-L32AWA<br>1766-L32AWAA | Group 0 | Isolated relay output | VAC/DC0 | OUT 0 |
| | Group 1 | Isolated relay output | VAC/DC1 | OUT 1 |
| | Group 2 | Isolated relay output | VAC/DC2 | OUT 2 |
| | Group 3 | Isolated relay output | VAC/DC3 | OUT 3 |
| | Group 4 | Isolated relay output | VAC/DC4 | OUT 4, OUT 5 |
| | Group 5 | Isolated relay output | VAC/DC5 | OUT 6, OUT 7 |
| | Group 6 | Isolated relay output | VAC/DC6 | OUT 8…11 |
| 1766-L32BXB<br>1766-L32BXBA | Group 0 | Isolated relay output | VAC/DC0 | OUT 0 |
| | Group 1 | Isolated relay output | VAC/DC1 | OUT 1 |
| | Group 2 | FET output | VDC2/COM 2 | OUT 2…7 |
| | Group 3 | Isolated relay output | VAC/DC3 | OUT 8 |
| | Group 4 | Isolated relay output | VAC/DC4 | OUT 9 |
| | Group 5 | Isolated relay output | VAC/DC5 | OUT 10, OUT 11 |

**WARNING**

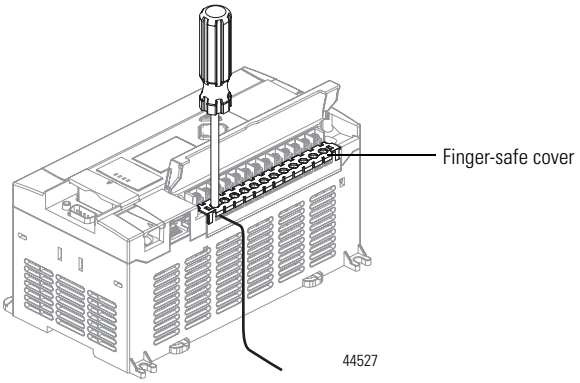
If you connect or disconnect wiring while the field-side power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding

**WARNING**

The local programming terminal port is intended for temporary use only and must not be connected or disconnected unless the area is free of ignitable concentrations of flammable gases or vapors.

## Wiring Recommendation

When wiring without spade lugs, keep the finger-safe covers in place. Loosen the terminal screw and route the wires through the opening in the finger-safe cover. Tighten the terminal screw, making sure the pressure plate secures the wire.



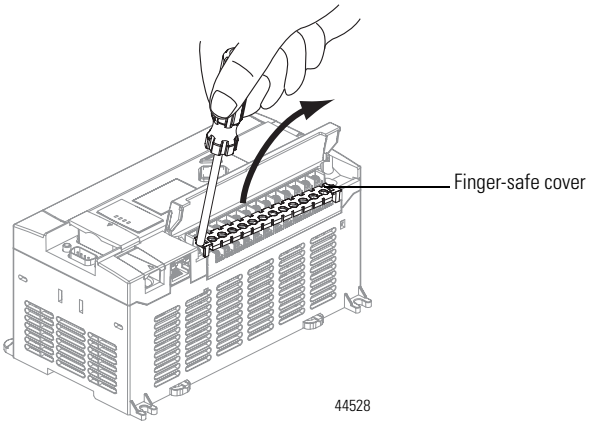

**ATTENTION**

Be careful when stripping wires. Wire fragments that fall into the controller could cause damage. Once wiring is complete, be sure the controller is free of all metal fragments before removing the protective debris strip. Failure to remove the strip before operating can cause overheating.

## Spade Lug Recommendation

The diameter of the terminal screw head is 5.5 mm (0.220 in.). The input and output terminals of the MicroLogix 1400 controller are designed for the following spade lugs. The terminals will accept a 6.35mm (0.25 in.) wide spade (standard for #6 screw for up to 14 AWG) or a 4 mm (metric #4) fork terminal.

When using spade lugs, use a small, flat-blade screwdriver to pry the finger-safe cover from the terminal blocks, then loosen the terminal screw.




**TIP** If you wire the terminal block with the finger-safe cover removed, you may not be able to put it back on the terminal block if the wires are in the way.

## Surge Suppression

**ATTENTION**

Inductive load devices such as motor starters and solenoids require the use of some type of surge suppression to protect the controller output. Switching inductive loads without surge suppression can significantly reduce the life of relay contacts or damage transistor outputs. By using suppression, you also reduce the effects of voltage transients caused by interrupting the current to that inductive device, and prevent electrical noise from radiating into system wiring. Refer to the MicroLogix 1400 Programmable Controller User Manual, publication 1766-UM001, for more information on surge suppression.

## Grounding the Controller

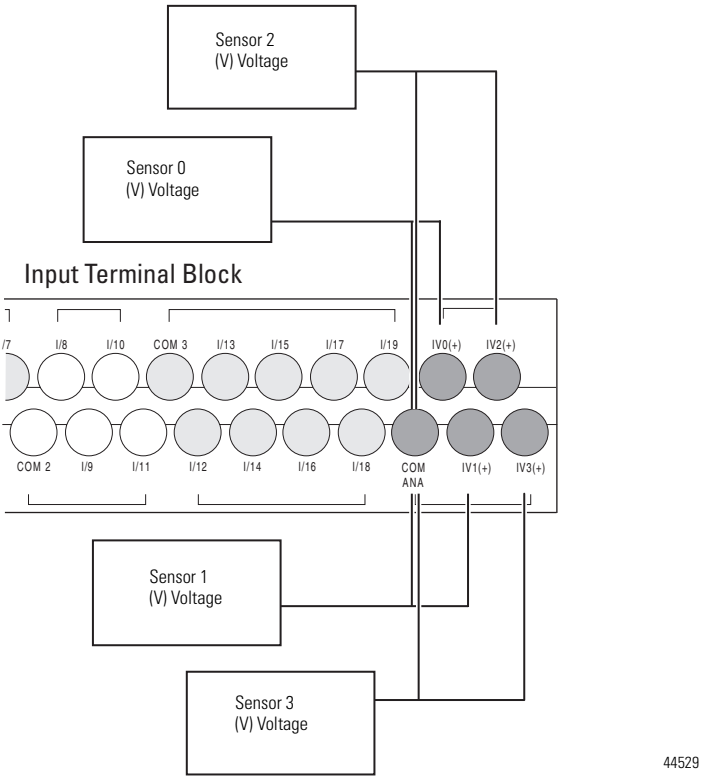
In solid-state control systems, grounding and wire routing helps limit the effects of noise due to electromagnetic interference (EMI). Run the ground connection from the ground screw of the controller to the ground bus prior to connecting any devices. Use AWG #14 wire. For AC-powered controllers, this connection must be made for safety purposes.

You must also provide an acceptable grounding path for each device in your application. For more information on proper grounding guidelines, refer to the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

## Wiring Your Analog Channels

Analog input circuits can monitor voltage signals and convert them to serial digital data as shown in the following illustration.

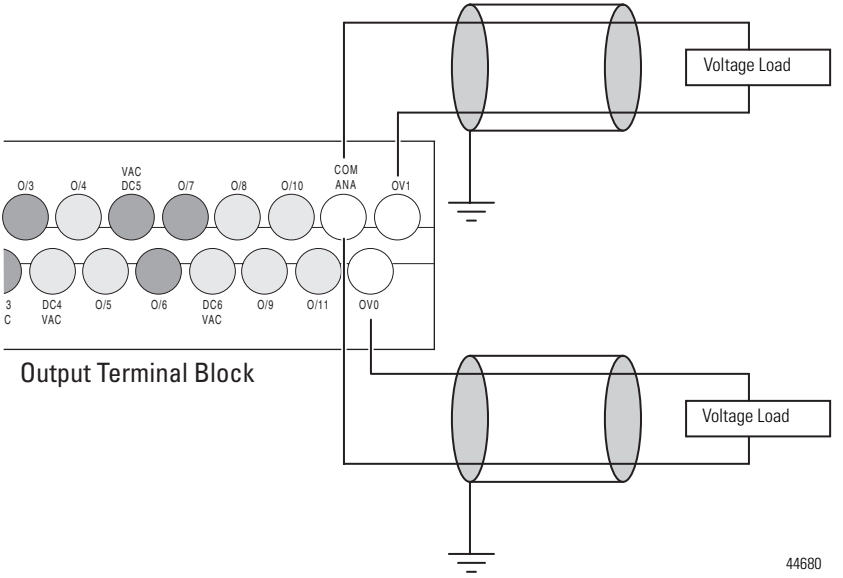
### Analog Input



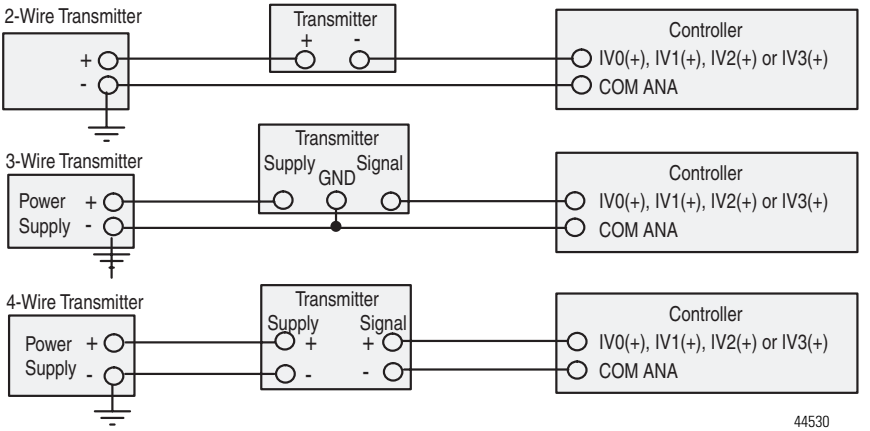
The controller does not provide loop power for analog inputs. Use a power supply that matches the transmitter specifications as shown.

The analog output can support a voltage function as shown in the following illustration.

### Analog Output




### Analog Input Transmitter Specifications



## Minimizing Electrical Noise on Analog Channels

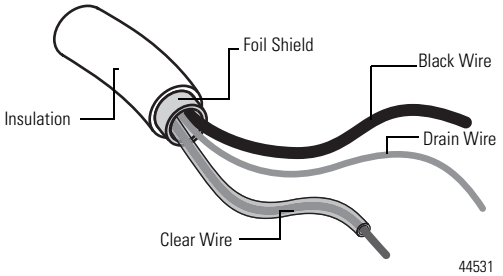
Inputs on analog channels employ digital high-frequency filters that significantly reduce the effects of electrical noise on input signals. However, because of the variety of applications and environments where analog controllers are installed and operated, it is impossible to ensure that all environmental noise will be removed by the input filters.

Several specific steps can be taken to help reduce the effects of environmental noise on analog signals:

- Install the MicroLogix 1400 system in a properly rated (NEMA) enclosure. Make sure that the MicroLogix 1400 system is properly grounded.
- Use Belden cable #8761 for wiring the analog channels, making sure that the drain wire and foil shield are properly earth grounded, (see Grounding Your Analog Cable on page 27 for more information).
- Route the Belden cable separately from any AC wiring. Additional noise immunity can be obtained by routing the cables in grounded conduit.

## Grounding Your Analog Cable

Use shielded communication cable (Belden #8761). The Belden cable has two signal wires (black and clear), one drain wire, and a foil shield. The drain wire and foil shield must be grounded at one end of the cable.




**IMPORTANT** Do not ground the drain wire and foil shield at both ends of the cable.

# Specifications

## General Specifications

| Description | 1766-L32AWA<br>1766-L32AWAA | 1766-L32BWA<br>1766-L32BWAA | 1766-L32BXB<br>1766-L32BXBA |
|---|---|---|---|
| Dimensions<br>HxWxD | 90 x 180 x 87 mm<br>3.5 x 7.087 x 3.43 in. | | |
| Shipping weight | 0.9 kg (2.0 lbs) | | |
| Number of I/O | 24 inputs (20 digital and 4 analog) and 14 outputs (12 digital and 2 analog) | | |
| Power supply voltage | 100…240V AC (-15%, +10%) @ 47…63 Hz | | 24V DC (-15%, +10%) Class 2 SELV |
| Heat dissipation | Refer to the MicroLogix 1400 Programmable Controllers User Manual, Publication 1766-UM001. | | |
| Power supply inrush current | 120V AC: 25 A for 8 ms<br>240V AC: 40A for 4 ms | | 24V DC:<br>15 A for 20 ms |
| Power consumption | 100 VA | 120 VA | 50W<br>7.5W (with no 1762 expansion I/O) |
| 24V DC sensor power | none | 24V DC @ 250 mA<br>400 µF max. | none |
| Input circuit type | Digital: 120V AC<br><br>Analog: 0…10V DC | Digital: 24V DC sink/source (standard and high-speed)<br>Analog: 0…10V DC | Digital: 24V DC sink/source (standard and high-speed)<br>Analog: 0…10V DC |
| Output circuit type | Relay | | Relay/FET |
| Relay life - Electrical | 2 x $10^5$ operations min (2.5 A, 250V AC / 30V DC) | | |
| Enclosure type rating | None (open-style) | | |
| Wire size | 0.25… 2.5 $mm^2$ (22…14 AWG) solid or stranded copper wire rated @ 90 °C (194 °F) or greater. | | |
| Wiring category(1) | 2 - on signal ports<br>2 - on power ports<br>3 - on communications ports | | |
| Terminal screw torque | 0.79 Nm (7.0 in-lb) rated | | |
| Pilot duty rating | R300, C300 | | |
| Expansion bus | Supports up to seven 1762 modules, up to a maximum of 5V, 1500 mA and 24 V, 1500 mA. | | |
| North American temp code | T3C | | |

(1) Use this Conductor Category information for planning conductor routing. Refer to Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

# Specifications for Inputs

## Digital Inputs

| Description | 1766-L32AWA<br>1766-L32AWAA | 1766-L32BWA, 1766-L32BWAA, 1766-L32BXB, 1766-L32BXBA | |
|---|---|---|---|
| | | Inputs 0 through 11<br>(12 high-speed DC inputs) | Inputs 12 and higher<br>(8 standard DC inputs) |
| On-state voltage range | 79…132 V AC | 4.5…24V DC, Class 2<br><br>(4.5…26.4V DC @ 60°C/140°F)<br>(4.5…30V DC @ 30°C/86°F) | 10…24V DC, Class 2<br><br>(10…26.4V DC @ 60°C/140°F)<br>(10…30V DC @ 30°C/86°F) |
| Off-state voltage range | 0…20 V AC | 0…1.5V DC | 0…5V DC |
| Operating frequency | 47…63 Hz | 0 Hz…100 kHz | 0 Hz…1 kHz<br>(scan time dependent) |
| On-state current<br>min<br>nom<br>max | <br>5.0 mA @ 79 V AC<br>12 mA @ 120 V AC<br>16.0 mA @ 132 V AC | <br>7.1 mA @ 4.5V DC<br>9.9 mA @ 24V DC<br>10.5 mA @ 30V DC | <br>3.2 mA @ 10V DC<br>5.3 mA @ 24V DC<br>5.5 mA @ 30V DC |
| Off-state leakage current | 2.5 mA max. | 0.2 mA max. | 1.5 mA max. |
| Nominal impedance | 12 kΩ @ 50 Hz<br>10 kΩ @ 60 Hz | 2.4 kΩ | 4.5 kΩ |
| Inrush current (max.) @ 120V AC | 250 mA | | |

## Analog Inputs

| Description | 1766-L32AWAA, -L32BWAA, -L32BXBA |
|---|---|
| Voltage input range | 0…10.0V DC - 1 LSB |
| Type of data | 12-bit unsigned integer |
| Input coding (0…10.0V DC - 1 LSB) | 0…4,095 |
| Voltage input impedance | >199 kΩ |
| Input resolution | 12 bit |
| Non-linearity | ±1.0% of full scale |
| Overall accuracy<br>-20…60 °C (-4…140 °F) | ±1.0% of full scale |
| Voltage input overvoltage protection | 10.5 V DC |
| Field wiring to logic isolation | Non-isolated with internal logic |

## Analog Outputs

| Description | 1766-L32AWAA, -L32BWAA, -L32BXBA |
|---|---|
| Number of inputs | 2 single-ended |
| Voltage output range | 0…10 V DC - 1 LSB |
| Type of data | 12 bit unsigned integer |
| Step response | 2.5 ms @ 95% |
| Load range<br>Voltage output | <br>1 KΩ |
| Output resolution | 12 bit |
| Analog output setting time | 3 ms (max.) |
| Overall Accuracy<br>-20…60 °C (-4…140 °F) | <br>±1.0% of full scale |
| Electrical isolation | Non-isolated with internal logic |
| Cable length | 30 m (98 ft) shielded cable |

## Relay and FET Outputs

| Description | | 1766-L32AWA, 1766-L32AWAA, 1766-L32BWA, 1766-L32BWAA | 1766-L32BXB, 1766-L32BXBA |
|---|---|---|---|
| Maximum controlled load | | 1440 VA | 1080 VA |
| **Maximum Continuous Current:** | | | |
| Current per channel and group common | | 2.5 A per channel<br>8A max channel 8…11 common | 2.5 A per channel |
| Current per controller | at 150V max | 28 A or total of per-point loads, whichever is less | |
| | at 240V max | 20 A or total of per-point loads, whichever is less | |

## Relay Outputs

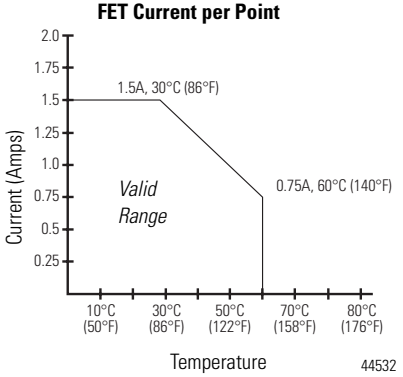
| Description | 1766-L32AWA, 1766-L32AWAA, 1766-L32BWA, 1766-L32BWAA, 1766-L32BXB, 1766-L32BXBA |
|---|---|
| Turn On Time/Turn Off Time | 10 ms (maximum)(1) |
| Load current | 10 mA (minimum) |

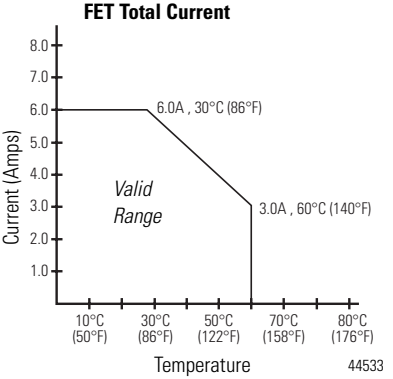
(1) Scan time dependent

| Maximum Volts | Amperes | | Amperes Continuous | Volt-Amperes | |
|---|---|---|---|---|---|
| | Make | Break | | Make | Break |
| 240V AC | 7.5 A | 0.75 A | 2.5 A | 1800 VA | 180 VA |
| 120V AC | 15.0 A | 1.5 A | 2.5 A | 1800 VA | 180 VA |
| 250V DC | 0.11 A | | 1.0 A | 28 VA | |
| 125V DC | 0.22 A | | 1.0 A | 28 VA | |

## 1766-L32BXB, 1766-L32BXBA FET Output

Maximum output current (temperature dependent):




| Description | General Operation | High Speed Operation[1] (Output 2, 3 and 4 Only) |
|---|---|---|
| Power supply voltage | 24V DC (-15%, 10%) Class 2 | |
| On-state voltage drop:<br>at max load current<br>at max surge current | <br>1V DC<br>2.5V DC | <br>Not Applicable<br>Not Applicable |
| Current rating per point<br>max load<br>min load<br>max leakage | <br>See graphic above<br>1.0 mA<br>1.0 mA | <br>100 mA<br>20 mA<br>1.0 mA |
| Surge current per point:<br>peak current<br>max surge duration<br>max rate of repetition @ 30 °C (86 °F)<br>max rate of repetition @ 60 °C (140 °F) | <br>4.0 A<br>10 ms<br>once every second<br>once every 2 seconds | <br>Not Applicable<br>Not Applicable<br>Not Applicable<br>Not Applicable |

| Description | General Operation | High Speed Operation[1] (Output 2, 3 and 4 Only) |
|---|---|---|
| Turn-On Time (maximum) | 11 µs | 28 ns |
| Turn-Off Time (maximum) | 89 µs | 2.3 µs |

(1) Output 2, 3 and 4 are designed to provide increased functionality over the other FET outputs. Output 2, 3 and 4 may be used like the other FET transistor outputs, but in addition, within a limited current range, they may be operated at a higher speed. Output 2, 3 and 4 also provide a pulse train output (PTO) or pulse width modulation output (PWM) function.

# Working Voltage

## Working Voltage for 1766-L32AWA, 1766-L32AWAA

| Description | Recommendation |
|---|---|
| Power supply input to backplane isolation | Verified by one of the following dielectric tests: 1836V AC for 1 second or 2596V DC for 1 second |
| | 265V AC Working Voltage (IEC Class 2 reinforced insulation) |
| Input group to backplane isolation | Verified by one of the following dielectric tests:1517V AC for 1 second or 2145V DC for 1 second |
| | 132V AC Working Voltage (IEC Class 2 reinforced insulation) |
| Input group to input group isolation | Verified by one of the following dielectric tests:1517V AC for 1 second or 2145V DC for 1 second |
| | 132V AC Working Voltage (basic insulation) |
| Output group to backplane isolation | Verified by one of the following dielectric tests: 1836V AC for 1 second or 2596V DC for 1 second |
| | 265V AC Working Voltage (IEC Class 2 reinforced insulation) |
| Output group to output group isolation | Verified by one of the following dielectric tests: 1836V AC for 1 second or 2596V DC for 1second |
| | 265V AC Working Voltage (basic insulation), 150V AC Working Voltage (IEC Class 2 reinforced insulation) |

### Working Voltage for 1766-L32BWA, 1766-L32BWAA

| Description | Recommendation |
|---|---|
| Power supply input to backplane isolation | Verified by one of the following dielectric tests:1836V AC for 1 second or 2596V DC for 1 second |
| | 265V AC Working Voltage (IEC Class 2 reinforced insulation) |
| Input group to backplane isolation and input group to input group isolation | Verified by one of the following dielectric tests: 1100V AC for 1 second or 1697V DC for 1 second |
| | 75V DC Working Voltage (IEC Class 2 reinforced insulation) |
| Output group to backplane Isolation | Verified by one of the following dielectric tests: 1836V AC for 1 second or 2596V DC for 1 second |
| | 265V AC Working Voltage (IEC Class 2 reinforced insulation). |
| Output group to output group isolation | Verified by one of the following dielectric tests: 1836V AC for 1 second or 2596V DC for 1 second |
| | 265V AC Working Voltage (basic insulation) 150V Working Voltage (IEC Class 2 reinforced insulation) |

### Working Voltage for 1766-L16BXB, 1766-L16BXBA

| Description | Recommendation |
|---|---|
| Input group to backplane isolation and input group to input group isolation | Verified by one of the following dielectric tests: 1100V AC for 1 second or 1697V DC for 1 second |
| | 75V DC Working Voltage (IEC Class 2 reinforced insulation) |
| FET output group to backplane isolation | Verified by one of the following dielectric tests: 1100V AC for 1 second or 1697V DC for 1 second |
| | 75V DC Working Voltage (IEC Class 2 reinforced insulation) |
| Relay output group to backplane isolation | Verified by one of the following dielectric tests: 1836V AC for 1 second or 2596V DC for 1 second |
| | 265V AC Working Voltage (IEC Class 2 reinforced insulation) |
| Relay output group to relay output group and FET output group isolation | Verified by one of the following dielectric tests: 1836V AC for 1 second or 2596V DC for 1 second |
| | 265V AC Working Voltage (basic insulation), 150V Working Voltage (IEC Class 2 reinforced insulation) |

## Environmental Specifications

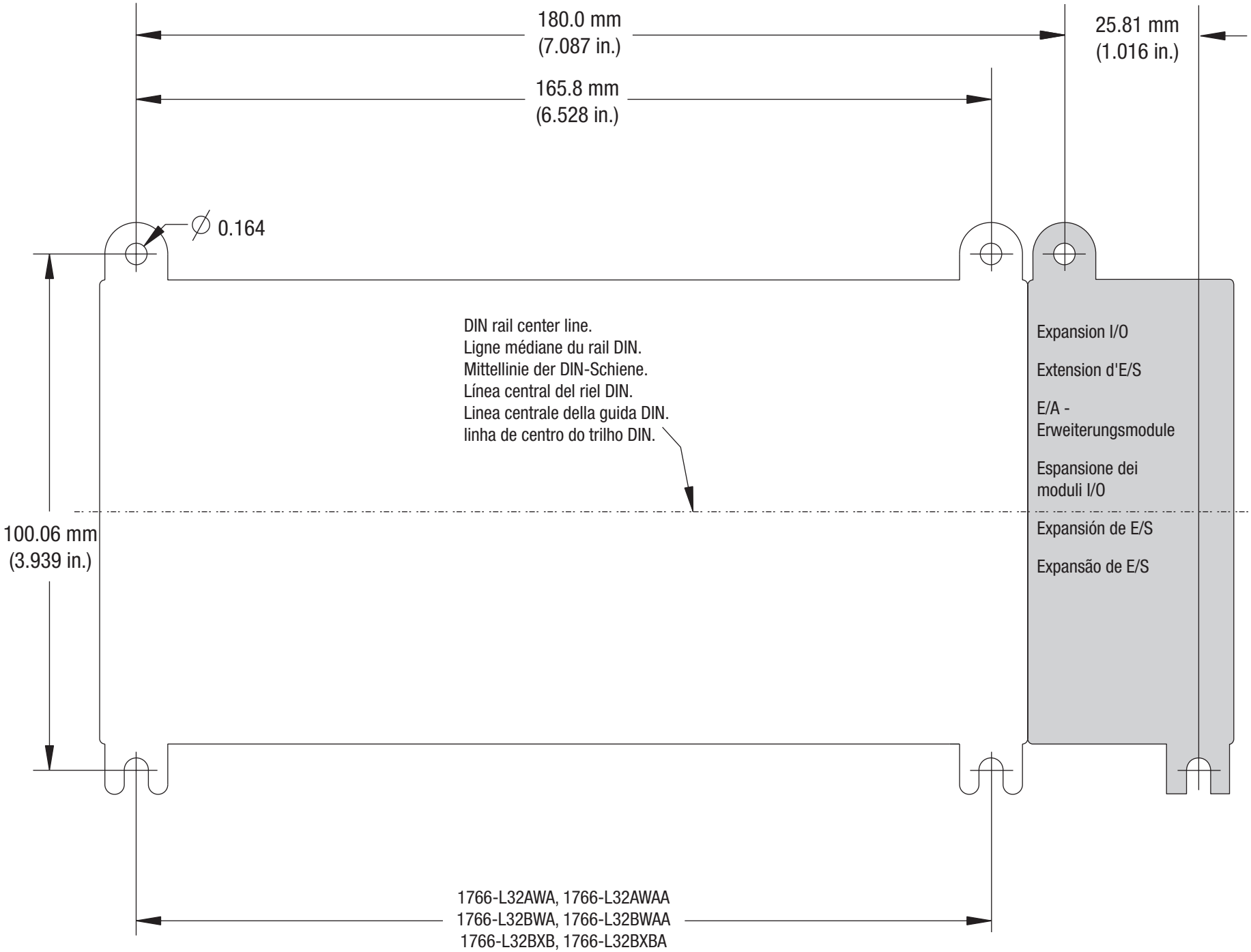
| Description | 1766-L32AWA<br>1766-L32AWAA | 1766-L32BWA<br>1766-L32BWAA | 1766-L32BXB<br>1766-L32BXBA |
|---|---|---|---|
| Temperature, operating | IEC 60068-2-1 (Test Ad, Operating Cold),<br>IEC 60068-2-2 (Test Bd, Operating Dry Heat),<br>IEC 60068-2-14 (Test Nb, Operating Thermal Shock):<br>-20… 60 °C (-4…140 °F) | | |
| Temperature, storage | IEC 60068-2-1 (Test Ab, Unpackaged Non-operating Cold),<br>IEC 60068-2-2 (Test Bb, Unpackaged Non-operating Dry Heat),<br>IEC 60068-2-14 (Test Na, Unpackaged Non-operating Thermal Shock):<br>-40…85 °C (-40…185 °F) | | |
| Relative humidity | IEC 60068-2-30 (Test Db, Unpackaged Damp Heat):<br>5…95% non-condensing | | |
| Vibration | IEC 60068-2-6 (Test Fc, Operating):<br>3 g @ 10… 500 Hz | | |
| Shock, operating | IEC 60068-2-27 (Test Ea, Unpackaged Shock):<br>30 g | | |
| Shock, nonoperating | IEC 60068-2-27 (Test Ea, Unpackaged Shock):<br>Panel mount - 50 g<br>DIN mount - 40 g | | |
| Emissions | CISPR 11<br>Group 1, Class A | | |
| ESD immunity | IEC 61000-4-2:<br>4 kV contact discharges<br>8 kV air discharges | | |
| Radiated RF immunity | IEC 61000-4-3:<br>10V/m with 1 kHz sine-wave 80% AM from 80…1000 MHz<br>3 V/m with 1 kHz sine-wave 80% AM from 1.4…2.0 GHz<br>1 V/m with 1 kHz sine-wave 80% AM from 2.0…2.7 GHz | | |
| EFT/B immunity | IEC 61000-4-4:<br>±2 kV @ 5 kHz on power ports<br>±2 kV @ 5 kHz on signal ports<br>±1 kV @ 5 kHz on communications ports | | |

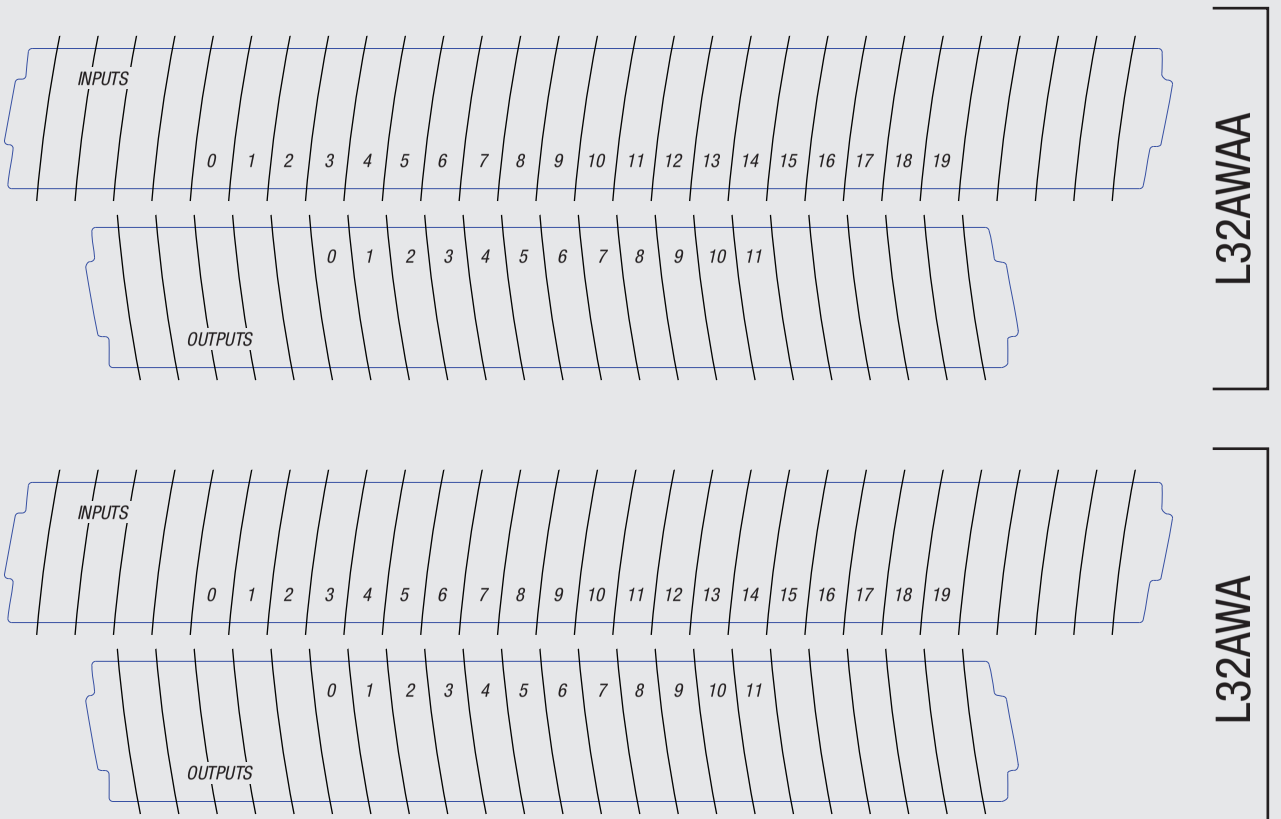
| Description | 1766-L32AWA<br>1766-L32AWAA | 1766-L32BWA<br>1766-L32BWAA | 1766-L32BXB<br>1766-L32BXBA |
|---|---|---|---|
| Surge transient immunity | IEC 61000-4-5:<br>±1 kV line-line(DM) and ±2 kV line-earth(CM) on AC power ports<br>±1 kV line-line(DM) and ±2 kV line-earth(CM) on signal ports<br>±1 kV line-earth(CM) on communications ports | | |
| Conducted RF immunity | IEC 61000-4-6:<br>10V rms with 1 kHz sine-wave 80% AM from 150 kHz…80 MHz | | |
| Voltage variation | IEC 6100-4-11:<br>60% dip for 10 periods on AC supply ports<br>30% dips for 25 periods @ 0° and 180° on AC supply ports<br>100% dip for 250 periods @ 0° and 180° on AC supply ports<br>100% dip for 0.5 periods, arbitrary angle, on AC supply ports | | |

## Certifications for 1766-L32AWA, 1766-L32AWAA, 1766-L32BWA, 1766-L32BWAA, 1766-L32BXB, 1766-L32BXBA

| Certification (when product is marked)(1) | Value |
|---|---|
| UL | UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations.<br>See UL File E10314. |
| c-UL | UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for Canada. See UL File E10314. |
| CE | European Union 2004/108/EC EMC Directive, compliant with:<br>EN 61000-6-2; Industrial Immunity<br>EN 61000-6-4; Industrial Emissions<br>EN 61131-2; Programmable Controllers (Clause 8, Zone A & B)<br>EN 61131-2; Programmable Controllers (Clause 11) |
| C-Tick | Australian Radiocommunications Act, compliant with:<br>AS/NZS CISPR 11; Industrial Emissions |

(1) See the Product Certification link at http://www.ab.com for Declaration of Conformity, Certificates, and other certification details.


180.0 mm
(7.087 in.)
25.81 mm
(1.016 in.)
165.8 mm
(6.528 in.)
∅ 0.164
DIN rail center line.
Ligne médiane du rail DIN.
Mittellinie der DIN-Schiene.
Línea central del riel DIN.
Linea centrale della guida DIN.
linha de centro do trilho DIN.
Expansion I/O
Extension d'E/S
E/A - Erweiterungsmodule
Espansione dei moduli I/O
Expansión de E/S
Expansão de E/S
100.06 mm
(3.939 in.)
1766-L32AWA, 1766-L32AWAA
1766-L32BWA, 1766-L32BWAA
1766-L32BXB, 1766-L32BXBA


INPUTS
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
OUTPUTS
0 1 2 3 4 5 6 7 8 9 10 11
L32AWAA
INPUTS
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
OUTPUTS
0 1 2 3 4 5 6 7 8 9 10 11
L32AWA

L32AWA

L32AWAA

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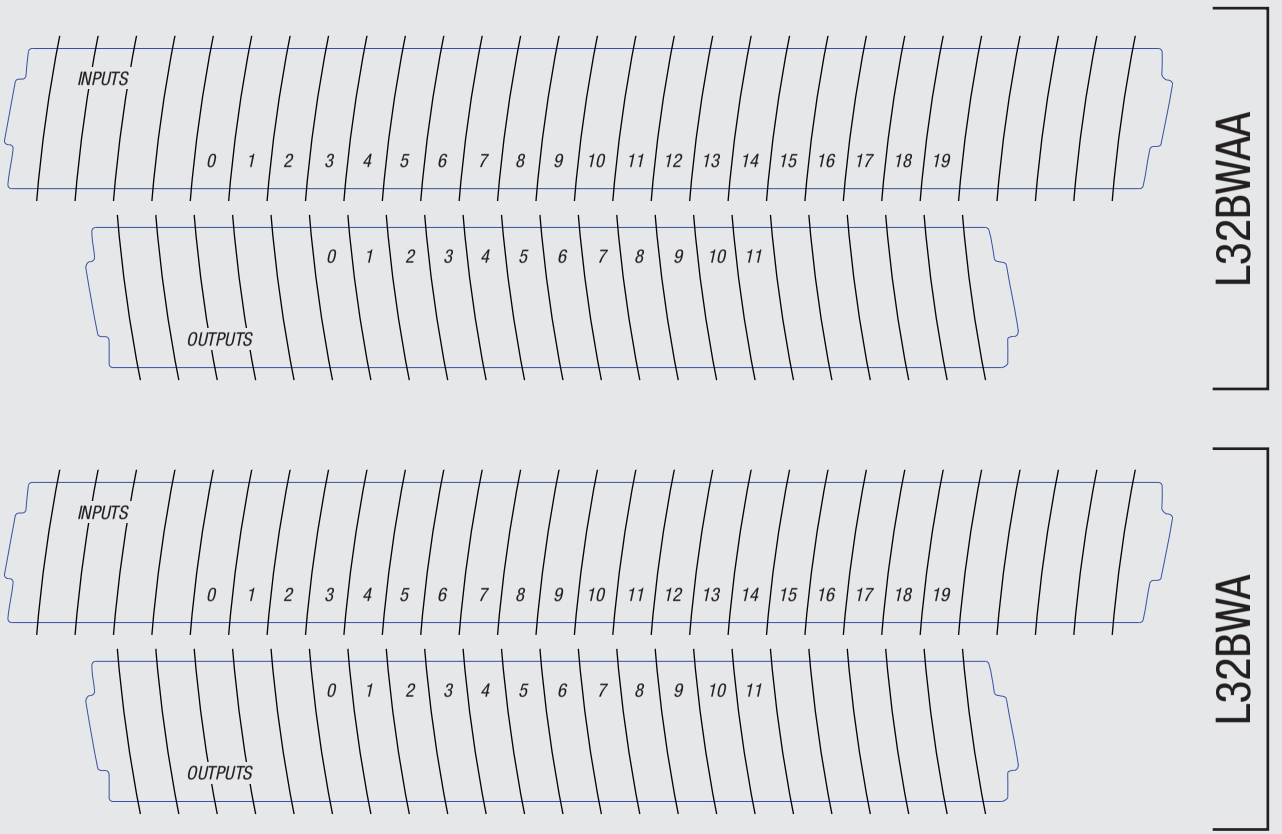
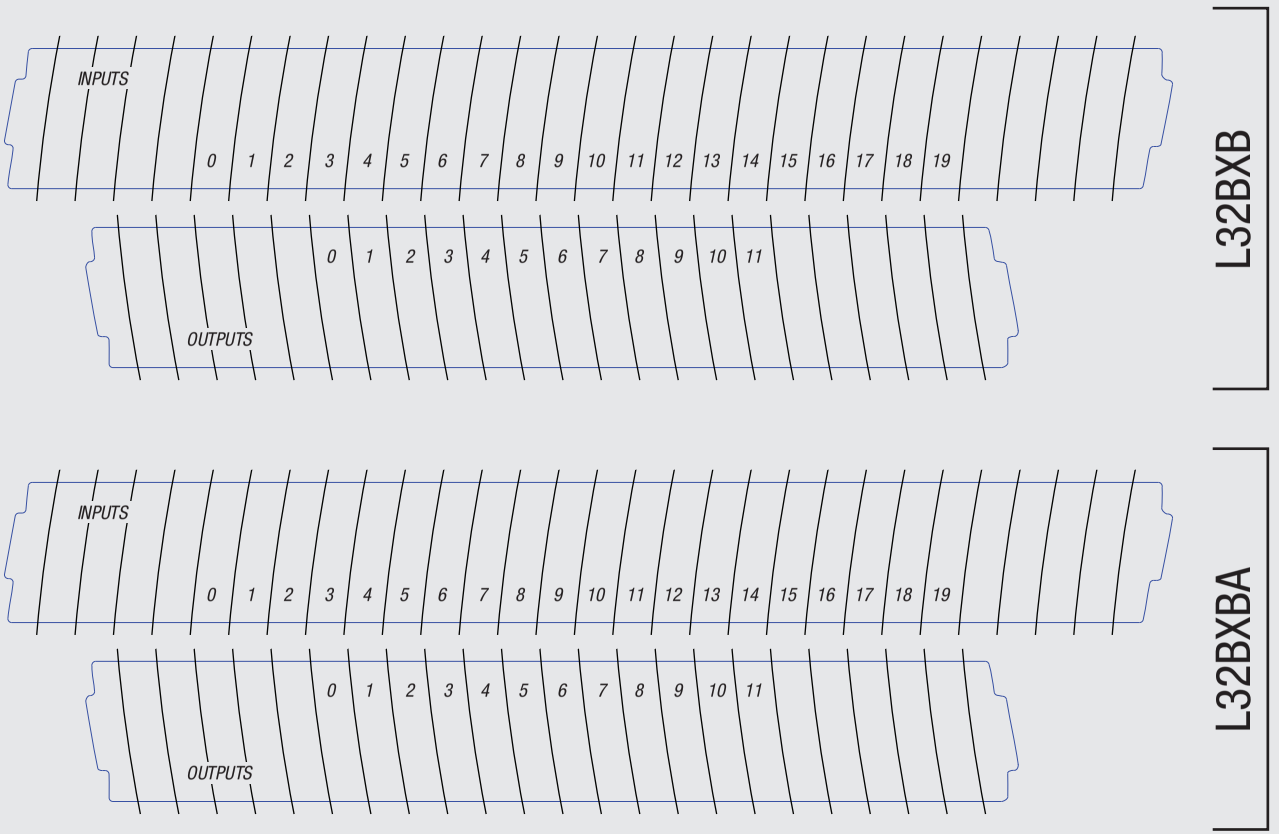

INPUTS
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
OUTPUTS
0 1 2 3 4 5 6 7 8 9 10 11
L32BWAA
INPUTS
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
OUTPUTS
0 1 2 3 4 5 6 7 8 9 10 11
L32BWA

1766-L32BWA
VAC L1
VAC L2/N
OUT 0
OUT 1
OUT 2
OUT 3
OUT 4
VAC DC5
OUT 7
OUT 8
OUT 10
NC
NC
VAC DC0
VAC DC1
VAC DC2
VAC DC3
VAC DC4
OUT 5
OUT 6
VAC DC6
OUT 9
OUT 11
NC
1766-L32BWA
COM 0
IN0
IN2
COM 1
IN5
IN7
IN8
IN10
COM 3
IN13
IN15
IN17
IN19
NC
NC
IN1
IN3
IN4
IN6
COM 2
IN9
IN11
IN12
IN14
IN16
IN18
NC
NC
NC
1766-L32BWAA
VAC L1
VAC L2/N
OUT 0
OUT 1
OUT 2
OUT 3
OUT 4
VAC DC5
OUT 7
OUT 8
OUT 10
COM ANA
OV1
VAC DC0
VAC DC1
VAC DC2
VAC DC3
VAC DC4
OUT 5
OUT 6
VAC DC6
OUT 9
OUT 11
OV0
1766-L32BWAA
COM 0
IN0
IN2
COM 1
IN5
IN7
IN8
IN10
COM 3
IN13
IN15
IN17
IN19
IV0
IV2
IN1
IN3
IN4
IN6
COM 2
IN9
IN11
IN12
IN14
IN16
IN18
COM ANA
IV1
IV3
L32BWAA
L32BWA

953203-16


INPUTS
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
OUTPUTS
0 1 2 3 4 5 6 7 8 9 10 11
L32BXB
INPUTS
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
OUTPUTS
0 1 2 3 4 5 6 7 8 9 10 11
L32BXBA

1766-L32BXBA
+24 VDC
VDC NEUT
VAC DC0
VAC DC1
VDC 2
OUT 3
OUT 5
OUT 7
COM 2
OUT 4
OUT 6
COM 2
OUT 8
OUT 9
OUT 10
OUT 11
COM ANA
OV0
OV1
1766-L32BXBA
COM 0
IN0
IN1
IN2
IN3
COM 1
IN4
IN5
IN6
IN7
COM 2
IN8
IN9
IN10
IN11
COM 3
IN12
IN13
IN14
IN15
IN16
IN17
IN18
IN19
COM ANA
IV0
IV1
IV2
IV3
1766-L32BXB
+24 VDC
VDC NEUT
VAC DC0
VAC DC1
VDC 2
OUT 3
OUT 5
OUT 7
COM 2
OUT 4
OUT 6
COM 2
OUT 8
OUT 9
OUT 10
NC
NC
VAC DC3
VAC DC4
VAC DC5
OUT 11
NC
1766-L32BXB
COM 0
IN0
IN1
IN2
IN3
COM 1
IN4
IN5
IN6
IN7
COM 2
IN8
IN9
IN10
IN11
COM 3
IN12
IN13
IN14
IN15
IN16
IN17
IN18
IN19
NC
NC
NC
NC
NC
NC
L32BXBA
L32BXB

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# Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At http://support.rockwellautomation.com, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration and troubleshooting, we offer TechConnect support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://support.rockwellautomation.com.

## Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running:

| | |
|---|---|
| United States | 1.440.646.3434 Monday – Friday, 8am – 5pm EST |
| Outside United States | Please contact your local Rockwell Automation representative for any technical support issues. |

## New Product Satisfaction Return

Rockwell Automation tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

| | |
|---|---|
| United States | Contact your distributor. You must provide a Customer Support case number (see phone number above to obtain one) to your distributor in order to complete the return process. |
| Outside United States | Please contact your local Rockwell Automation representative for return procedure. |

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